

CLAIMS

1. A golf stroke practicing aid comprising:
a target adapted to be struck by a golf-club;
5 guiding means for constraining said target to move
in a substantially horizontal orbit when struck;
measuring means for measuring the initial speed of
the target when struck;
processing means configured to determine a notional
10 total distance that the target should travel in its orbit
corresponding to said initial speed; and
motion controlling means adapted to control the
movement of the target in its orbit when struck such that
the target actually moves a total distance which is
15 substantially the same as said notional total distance.

2. A practicing aid as claimed in claim 1, wherein
said notional total distance approximates the total
distance that a standard golf ball would have traveled
20 freely on a real putting green.

3. A practicing aid as claimed in claim 1, wherein
said processing means are adapted to calculate a notional
relationship between the instantaneous speed of the
25 target and the elapsed time after striking said target
based on said notional total distance, said measuring
means are adapted to measure continually the elapsed time
after striking the target and the actual instantaneous
speed of the target as it moves in said orbit, and said
30 motion controlling means are adapted to compare the
actual instantaneous speed with said notional
instantaneous speed and to adjust continually the speed

of the target accordingly to ensure that the target moves about said total distance.

4. A practicing aid as claimed in claim 1, wherein
5 said measuring means comprise a first motion detector which is adapted to generate a first pulsed motion detection signal in response to movement of the target, the frequency of said first pulsed signal corresponding to the speed of the target.

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5. A practicing aid as claimed in claim 4, wherein each pulse corresponds to movement of the target in said orbit by a predetermined increment of distance, said measuring means being configured to calculate the speed
15 of the target from the time between successive pulses.

6. A practicing aid as claimed in claim 5, wherein said first motion detector comprises a first rotatable part and a first fixed part, the first rotatable part
20 being coupled to the target such that movement of the target in its orbit when struck causes corresponding rotation of said first rotatable part about an axis of rotation relative to the first fixed part, wherein one of said first rotatable and fixed parts comprises a first
25 optical encoder ring which is disposed substantially coaxially with the axis of rotation, and the other of said parts comprises a first photo-emitter and a first photo-detector adapted to detect light emitted by said first photo-emitter, wherein said first optical encoder ring
30 comprises a plurality of regular formations which are circumferentially spaced at substantially equal intervals about said encoder ring to define a plurality of regular gaps therebetween, said first photo-emitter is arranged

to direct a beam of light at the first encoder ring, such that the formations intermittently interrupt the beam as the first rotatable part rotates to produce a series of pulses of light; and said first photo-detector is
5 arranged to detect said pulses of light and to generate a corresponding first pulsed motion detection signal in which each pulse corresponds to a pulse of light.

7. A practicing aid as claimed in claim 4, further
10 comprising direction determining means for determining the direction of movement of the target in its orbit.

8. A practicing aid as claimed in claim 7, wherein said direction determining means comprise a second motion
15 detector which is adapted to generate a second pulsed motion detection signal in response to movement of the target, the frequency of said second pulsed signal corresponding to the speed of the target and being substantially the same as the frequency of the first
20 pulsed signal, and comparing means for comparing the first and signal signals, the phases of the first and second pulsed signals being off-set to allow said comparing means to determine, and said comparing means being configured to determine, the direction of movement
25 of the target by quadrature.

9. A practicing aid as claimed in claim 6, further comprising a second motion detector comprising a second rotatable part and a second fixed part, the second
30 rotatable part being coupled to the target such that movement of the target in its orbit when struck causes corresponding rotation of said second rotatable part about an axis of rotation relative to the second fixed

part, wherein one of said second rotatable and fixed parts comprises a second optical encoder ring which is disposed substantially co-axially with the axis of rotation, and the other of said parts comprises a second photo-emitter and a second photo-detector adapted to detect light emitted by said second photo-emitter, wherein said second optical encoder ring comprises a plurality of regular formations which are circumferentially spaced at substantially equal intervals about said encoder ring to define a plurality of regular gaps therebetween, said second photo-emitter is arranged to direct a beam of light at the second encoder ring, such that the formations intermittently interrupt the beam as the second rotatable part rotates to produce a series of pulses of light; and said second photo-detector is arranged to detect said pulses of light and to generate a corresponding second pulsed motion detection signal in which each pulse corresponds to a pulse of light, the first and second motion detectors being configured and arranged such the frequencies of said first and second pulsed signals are substantially the same, and the phases of the first and second pulsed signals are off-set such that the direction of movement of the target can be determined by quadrature.

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10. A practicing aid as claimed in claim 9, wherein the phases of said first and second pulsed signals are offset by about 90°.

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11. A practicing aid as claimed in claim 1, wherein said motion controlling means comprise:

a motor which is drivingly coupled to said target for controlling movement thereof; and

motor controlling means for controlling operation of the motor.

12. A practicing aid as claimed in claim 11,
5 wherein said motor controlling means comprise an H-bridge motor drive.

13. A practicing aid as claimed in claim 1, further comprising restoring means for restoring the target to a
10 home position.

14. A practicing aid as claimed in claim 9, wherein one of said first and second optical encoder rings comprises a home formation having a unique size or
15 spacing as compared with the other formations on said one ring for allowing the rotational orientation of the respective rotatable part, and thus the rotational orientation of the target, to be determined.

15. A practicing aid as claimed in claim 14,
20 wherein said home formation is configured so as to alter transiently the phase off-set between said first and second motion detection signals when the target is at its home position.

16. A practicing aid as claimed in claim 15,
25 wherein said respective rotatable part is arranged such that said home finger is disposed adjacent the respective photo-emitter and photo-detector when the target is in
30 the home position.

17. A practicing aid as claimed in claim 16, further comprising home restoring means which are adapted

to generate a home restoration signal for controlling
said motion controlling means to move the target at a
constant speed in its orbit, and to analyze the pulsed
motion detection signal generated by the first and second
5 motion detectors for determining when the home formation
is disposed adjacent the respective photo-emitter and
photo-detector, said home restoring means being
configured to control the motion controlling means then
to halt so that the target is positioned at the home
10 position.

18. A practicing aid as claimed in claim 9, wherein
said guiding means comprise a rigid or substantially
rigid arm, said target being mounted on one end of the
15 arm and the other end of the arm being secured to one of
said first and second rotatable parts.

19. A practicing aid as claimed in claim 9, wherein
said target comprises a standard golf ball.

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20. A practicing aid as claimed in claim 9, further
comprising display means for receiving and displaying
information to a user.

25 21. A practicing aid as claimed in claim 9, further
comprising communication means for transmitting data to
and/or receiving data from external equipment.

22. A practicing aid as claimed in claim 9, further
30 comprising user input means for manually selecting of one
or more parameters of operation of the practicing aid.

23. A golf stroke training device comprising:
a supporting structure which is adapted to stand
stably on the ground in use;
a rotator defining an axis of rotation, said rotator
5 being rotatably mounted to said supporting structure such
that said axis of rotation extends substantially
vertically when the supporting structure stands on the
ground, said rotator being adapted for rotation about
said axis;
10 a rigid or substantially rigid arm having an inner
end and an outer end, said inner end being connected to
said rotator, said arm being arranged such that said
outer end is adapted to rotate in a substantially
horizontal plane upon rotation of the rotator;
15 a target adapted to be struck by a golf-club, said
target being joined to said outer end of said arm, such
that when the target is struck by a golf-club, the target
is caused to rotate about said axis of rotation in a
substantially horizontal orbit;
20 a first optical encoder ring mounted on said rotator
for rotation therewith, said first optical encoder ring
comprising a plurality of regular formations which are
circumferentially spaced about said axis of rotation at
substantially equal intervals, said ring having a first
25 inner side and a second outer side;
a first photo-emitter adapted to emit a beam of
light, and a first photo-detector adapted to detect light
emitted by said first photo-emitter, said first photo-
emitter and first photo-detector being fixedly mounted to
30 said supporting structure on opposite sides of said first
optical encoder ring, such that said beam is directed
across the formations of the first optical encoder ring
towards said first photo-detector, such that said

formations interrupt the beam intermittently as the rotator rotates to produce a series of pulses of light, which pulses of light are detected by said photo-detector to produce a first pulsed motion detection signal,
5 whereby the time between successive pulses of said pulsed motion detection signal is proportional to the speed of said target;

a motor which is mounted to said supporting structure and drivably coupled to the rotator for
10 adjusting the speed of the rotator;

a motor controller for controlling the motor; and
a microcontroller having an input which is adapted to receive said first motion detection signal, a clock configured to provide a constant measure of time, a
15 microprocessor adapted continually to process said first motion detection signal to determine the actual instantaneous speed of the target, said microprocessor being programmed to detect when the target is struck and to calculate the initial speed of said target, a memory
20 device storing distance information relating a total notional distance to be traveled by the target to said initial speed, said microprocessor being programmed for determining from said initial speed and said distance information a particular notional total distance to be
25 traveled by said target and for determining from said particular total notional distance a relationship between the notional instantaneous speed of the target and the time elapsed since the target was struck, said microprocessor being further programmed to compare
30 continually the actual instantaneous speed of the target with said notional instantaneous speed to generate a velocity error value, and to generate a motor control signal corresponding to said velocity error value, and an

output adapted for outputting said motor control signal to said motor controller for controlling the motor to adjust the actual instantaneous speed of the target to said notional instantaneous speed, such that the actual total distance traveled by said target in its orbit is substantially the same as said particular notional total distance.

24. A training device as claimed in claim 23, wherein said memory device stores a plurality of different, predetermined, user-selectable values of notional resistance to rotation of the rotator, and stores distance information for each value of notional resistance relating the total notional distance to be traveled by the target to said initial speed, said microcontroller further comprises a user-selection input component which is adapted to enable a user to select a desired one of said predetermined values.

25. A training device as claimed in claim 23, further comprising:

a second optical encoder ring mounted to the rotator for rotation therewith, said second optical encoder ring being arranged substantially coaxially with said first optical encoder ring, and comprising a plurality of regular formations which are circumferentially spaced about said axis of rotation at substantially equal intervals, said ring having a first inner side and a second outer side;

a second photo-emitter adapted to emit a beam of light, and a second photo-detector adapted to detect light emitted by said second photo-emitter, said second photo-emitter and second photo-detector being fixedly

mounted to said supporting structure on opposite sides of
said second optical encoder ring, such that said beam is
directed across the formations of said second optical
encoder ring, such that said formations can interrupt
5 said beam intermittently as the rotator rotates to
produce a series of pulses of light, which pulses of
light are detected by said photo-detector to produce a
second pulsed motion detection signal;

10 said first and second optical encoder rings, said
first and second photo-emitters and said first and second
photo-detectors being configured and arranged such the
frequencies of said first and second pulsed signals are
substantially the same, and the phases of the first and
second pulsed signals are off-set;

15 wherein said input is further adapted to receive
said second motion detection signal, and said
microprocessor is further programmed to compare said
second motion detection signal with said first motion
detection signal to determine the direction of rotation
20 of the rotator by quadrature.

26. A training device as claimed in claim 25,
wherein said motor controller comprises an H-bridge motor
drive.

25 27. A training device as claimed in claim 25,
wherein one of said first and second optical encoder
rings comprises a home formation of unique size or unique
spacing as compared with the other formations on said one
30 optical encoder ring, said home formation being
positioned on said one encoder ring such that said home
formation is positioned adjacent the respective photo-

emitter and photo-detector when the target is in a home position; and

5 said microprocessor is programmed with a selectively operable home restoration routine, which home restoration routine comprises outputting appropriate motor control signals for controlling said motor to drive said rotator at a constant angular velocity whilst processing the respective motion detection signal to detect the home formation, and when said home formation is detected
10 ceasing output of said motor control signals to halt operation of the motor, thereby bringing said rotator to rest at the home position.

28. A training device as claimed in claim 25,
15 wherein said target comprises a standard golf ball.

29. A training device as claimed in claim 25,
further comprising a display device for receiving and displaying information to a user.

20 30. A training device as claimed in claim 25, further comprising a communication device for transmitting data to and/or receiving data from external computer equipment.

25 31. A putting practicing aid comprising:
a base member adapted to stand stably on the ground;
a rotator mounted to the base member and adapted
30 for rotation about a substantially vertical axis;
a target mounted to said rotator for rotation about said axis in a substantially horizontal orbit, said target being adapted to be struck by a golf putter; and

motion controlling means for controlling rotation of said rotator by applying a predetermined resistance to movement of the target to simulate the feel of putting a golf ball on a real green.

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32. A putting practicing aid as claimed in claim 31, wherein said motion controlling means are configured to apply selectively a plurality of different, predetermined, user-selectable values of resistance to rotation of the rotator, and means are provided to enable a user to select a desired one of said predetermined values.

33. A putting practicing aid as claimed in claim 31, wherein said motion controlling means comprise a motor drivably connected to said rotator.

34. A putting practicing aid as claimed in claim 31, wherein said motion controlling means comprise means for measuring the initial velocity of the rotator, clock means for measuring the time elapsed from striking the target, means for calculating a notional total distance to be traveled from said initial velocity and said value of resistance to rotation, means for calculating a notional relationship between notional instantaneous speed of said rotator and elapsed time after striking from said notional total distance to be traveled, means for continually measuring the actual instantaneous speed of the rotator at predetermined elapsed times after the target is struck, speed comparing means for comparing the actual instantaneous speed of the rotator at each elapsed time with the notional instantaneous speed, and means for

adjusting the speed of the rotator as necessary to the notional instantaneous speed.

35. A putting practicing aid as claimed in claim 5 34, wherein said motion controlling means comprise a first motion detector which is adapted to generate a first pulsed motion signal in response to rotation of the target, the frequency of said first pulsed signal corresponding to the speed of the target.

10 36. A practicing aid as claimed in claim 35, wherein each pulse corresponds to movement of the target in said orbit by a predetermined increment of distance, said measuring means being adapted to calculate the speed 15 of the target from time between successive pulses and the size said increment

37. A putting practicing aid as claimed in claim 35, wherein said first motion detector comprises a first 20 rotatable part and a first fixed part, the first rotatable part being coupled to the rotator such that movement of the target in its orbit when struck causes corresponding rotation of said first rotatable part relative to the first fixed part, wherein one of said 25 first rotatable and fixed parts comprises a first optical encoder ring, and the other of said parts comprises a first photo-emitter and a first photo-detector adapted to detect light emitted by said first photo-emitter, wherein said first optical encoder ring comprises a plurality of 30 regular formations which are circumferentially spaced at substantially equal intervals about said encoder ring to define a plurality of regular gaps therebetween, said first photo-emitter is arranged to direct a beam of light

at the first encoder ring, such that the formations intermittently interrupt the beam as the first rotatable part rotates to produce a series of pulses of light; and said first photo-detector is arranged to detect said
5 pulses of light and to generate a corresponding first pulsed motion detection signal in which each pulse corresponds to a pulse of light.

38. A putting practicing aid as claimed in claim
10 37, further comprising direction determining means for determining the direction of rotation of the target.

39. A putting practicing aid as claimed in claim
15 38, wherein said direction determining means comprise a second motion detector which is adapted to generate a second pulsed motion signal in response to movement of the target, the frequency of said second pulsed signal corresponding to the speed of the target and being substantially the same as the frequency of the first
20 pulsed signal, and signal comparing means for comparing the first and signal signals, the phases of said first and second pulsed signals being mutually offset to allow said comparing means to determine, and said signal comparing means being programmed to determine the
25 direction of movement of the target by quadrature.

40. A practicing aid as claimed in claim 39,
further comprising a second motion detector comprising a second rotatable part and a second fixed part, the second
30 rotatable part being coupled to the rotator such that rotation of the target when struck causes corresponding rotation of said second rotatable part relative to the second fixed part, wherein one of said second rotatable

and fixed parts comprises a second optical encoder ring,
and the other of said parts comprises a second photo-
emitter and a second photo-detector adapted to detect
light emitted by said second photo-emitter, wherein said
5 second optical encoder ring comprises a plurality of
regular formations which are circumferentially spaced at
substantially equal intervals about said encoder ring to
define a plurality of regular gaps therebetween, said
second photo-emitter is arranged to direct a beam of
10 light at the second encoder ring, such that the
formations intermittently interrupt the beam as the
second rotatable part rotates to produce a series of
pulses of light; and said second photo-detector is
arranged to detect said pulses of light and to generate a
15 corresponding second pulsed motion detection signal in
which each pulse corresponds to a pulse of light, the
first and second motion detectors being configured and
arranged such the frequencies of said first and second
pulsed signals are substantially the same, and the phases
20 of the first and second pulsed signals are off-set such
that the direction of movement of the target can be
determined by quadrature.

41. A putting practicing aid as claimed in claim
25 40, wherein the phases of said first and second pulsed
signals are mutually offset by about 90°.

42. A putting practicing aid as claimed in claim
33, wherein said motion controlling means further
30 comprise motor controlling means for controlling
operation of the motor.

43. A putting practicing aid as claimed in claim 42, wherein said motor controlling means comprise an H-bridge motor drive.

5 44. A putting practicing aid as claimed in claim 31, further comprising restoring means for restoring the target to a home position.

10 45. A putting practicing aid as claimed in claim 40, wherein one of said first and second optical encoder rings comprises a home formation having a unique size or spacing as compared with the other formations on said one ring for allowing the rotational orientation of the respective rotatable part, and thus the rotational
15 orientation of the target, to be determined.

 46. A putting practicing aid as claimed in claim 45, wherein said respective rotatable part is arranged such that said home formation is disposed adjacent the
20 respective photo-emitter and photo-detector when the target is in the home position.

 47. A putting practicing aid as claimed in claim 46, further comprising home restoring means which are
25 adapted to generate a home restoration signal for controlling said motion controlling means to rotate the target at a constant speed , and to analyze the pulsed signal generated by the respective motion detector for determining when the home formation is disposed adjacent
30 the respective photo-emitter and second photo-detector, said home restoring means being configured to control the motion controlling means then to halt so that the target is positioned at the home position.

48. A putting practicing aid as claimed in claim 31, wherein said target is connected to said rotator by a rigid or substantially rigid arm.

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49. A putting practicing aid as claimed in claim 31, wherein said target comprises a standard golf ball.

50. A putting practicing aid as claimed in claim 31, further comprising display means for receiving and displaying information to a user.

51. A putting practicing aid as claimed in claim 31, further comprising communication means for transmitting data to and/or receiving data from external equipment.

52. A putting practicing aid comprising:
a base member adapted to stand stably on the ground,
said base member having an upper surface;
a rotator mounted to the base member for rotation about a substantially vertical axis;
a target mounted to said rotator for rotation about said axis in a substantially horizontal orbit, said target being adapted to be struck by a golf putter; and
an elongate golf putter guiding member, said guiding member being detachably mountable to the upper surface of said base member, and having a guiding surface, said guiding surface being configured and arranged such that when a user of the practicing aid strikes the target, the heel of the user's putter may be moved along the length of the guiding surface, in contact or close proximity

therewith, for guiding the putter lengthwise along said surface during a stroke.

53. A putting practicing aid as claimed in claim
5 52, wherein said guiding surface is straight, or curves convexly along its length.

54. A practicing aid as claimed in claim 52,
wherein said guiding surface is arranged substantially
10 vertically.

55. A putting practicing aid as claimed in claim
54, wherein said curve defines an arc of an ellipse.

15 56. A putting practicing aid as claimed in claim 52, wherein the golf putter guiding member has two opposite putter guiding surfaces, and said guiding member is adapted to be mounted on the base member in two different configurations, such that in each
20 configuration, a different respective one of the putter guide surfaces faces the target and can be used for guiding the putter of a user.

57. A putting practicing aid as claimed in claim
25 56, wherein one of said guide surfaces is straight and the other guide surface curves along its length.

58. A putting practicing aid as claimed in claim
52, wherein said golf putter guiding member has a lower
30 portion, and is mountable to said support via two or more spaced protrusions which are provided on said lower portion, said protrusions being adapted to be inserted into two or more sockets provided on the upper surface of

the base member, said sockets being arranged in positions which correspond to the arrangement of said protrusions.

59. A golf stroke practicing aid comprising:
5 a target adapted to be struck by a golf-club from a home position;
guiding means for constraining said target to move in a substantially horizontal orbit when struck;
home restoring means for restoring the target to the
10 home position after the target has been moved from said home position, said restoring means comprising; a detector for detecting when the target is at the home position; a motor which is drivingly coupled to said target; and motor controlling means for controlling
15 operation of the motor which motor controlling means causes the motor to drive said target until the detector detects that the target is at the home position whereupon the motor controlling means causes the motor and target to halt.

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60. A golf stroke practicing aid as claimed in claim 59, wherein said detector comprises a rotatable part and a fixed part, the rotatable part being coupled to the target such that movement of the target in its
25 orbit when struck causes corresponding rotation of the rotatable part about an axis of rotation relative to the fixed part, wherein one of said rotatable and fixed parts comprises an optical encoder ring which is disposed substantially co-axially with the axis of rotation, and
30 the other of said parts comprises a photo-emitter and a photo-detector adapted to detect light emitted by said photo-emitter, wherein said encoder ring comprises a home formation which either interrupts said beam or allows

passage of said beam, as the rotatable part rotates, to allow orientation of the target to be determined.

5 61. A golf stroke practicing aid as claimed in claim 60, wherein said home formation is disposed adjacent the photo-emitter and photo-detector when the target is at the home position.

10 62. A putting practicing aid comprising:
a base member adapted to stand stably on the ground, said base member having an upper surface;
a rotator mounted to the base member and adapted for rotation about a substantially vertical axis;
a target mounted to said rotator for rotation about
15 said axis in a substantially horizontal orbit, said target being adapted to be struck by a golf putter from a home position;
wherein the upper surface of the base member defines a recess which is configured to receive an insert, said
20 insert having first and second opposite surfaces, said first surface being made of or coated with a light-reflective material, and said insert being configured for installation in said recess in at least two different configurations, such that in one configuration, said
25 first surface is visible to a user of the practicing aid, and in the other configuration, said second surface is visible to a user, said recess being positioned on the upper surface of the base member such that when the insert is received therein in either of said
30 configurations, the respective one of the first or second surfaces is disposed generally beneath the home position of the target.

63. A putting practicing aid as claimed in claim
62, wherein when said insert is installed in said recess
in said one configuration, said first surface lies
substantially flush with the upper surface of the said
5 base member, and when said insert is installed in said
recess said other configuration, said second surface lies
substantially flush with the upper surface of the base
member.

10 64. A putting practicing aid as claimed in claim
62, wherein said recess is adapted to allow manual
removal of the insert from the stationary support.

15 65. A putting practicing aid as claimed in claim
62, wherein said first and second surfaces of the insert
are substantially rectangular in shape.

20 66. A putting practicing aid as claimed claim 62,
wherein the second of said surfaces is coated with or
formed from a material that simulates the texture of
grass on a putting green.